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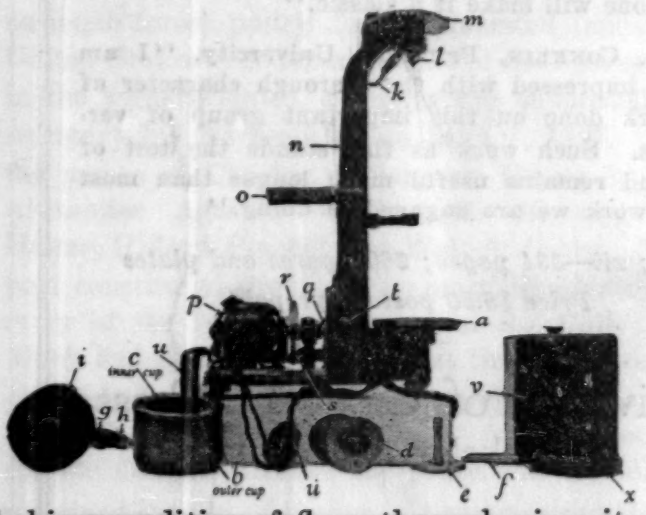

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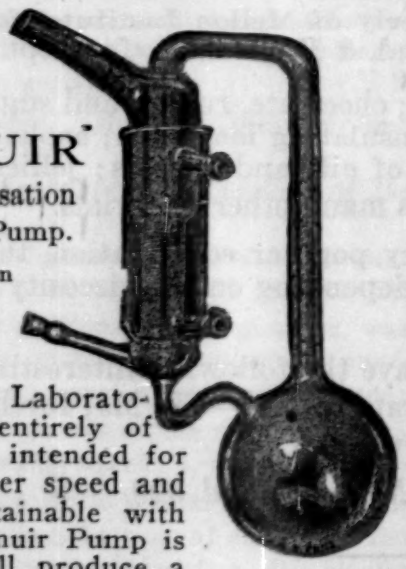

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THE SCIENTIFIC BACKGROUND OF THE FOREST POLICY OF THE UNITED STATES[1]

THE National Academy of Sciences has played an important part in the annals of American forestry. On February 15, 1896, the secretary of the interior requested this body to investigate and report upon "a national forest policy for the forested lands of the United States." After an extended field investigation in the western states, a report was submitted to the secretary by the academy on May 1, 1897. It bore the names of Charles S. Sargent, Henry L. Abbott, Alexander Agassiz, William H. Brewer, Arnold Hague, Gifford Pinchot and Walcott Gibbs. This report constituted probably the most illuminating summary of the forestry situation in the United States which had been made up to that time, with reference particularly to the conditions on the public domain. It set forth the public value of forest conservation for the flow of streams, the protection of soil and a sustained supply of timber. It summarized the forest administration of leading foreign countries. It described vividly the cumulative depletion of our public forest resources from fire, uncontrolled grazing and timber depredations, with its disastrous local and national effects. It recommended the creation of 13 additional forest reserves, aggregating 21,000,000 acres, together with the Mt. Rainier and Grand Canyon National Parks. And it outlined a complete system of administration for the forest lands in public ownership.

The major recommendations of the academy were almost immediately put into effect. The forest reserves indicated were created by presidential proclamation in 1897. In the same year an act of Congress embodied many of the administrative recommendations of the academy, constituting the first forest code of the United States.

While the investigation conducted by the academy in 1896 dealt particularly with forested portions of the public domain, it is noteworthy that the report visualized clearly the broad outlines of the forestry problem of the entire country. It emphasized the essential relationship between forest cover and regularity of stream flow. It brought out the need for "systematic and intelligent forest reproduction" to supply the demand for lumber and other forest products which is "continuous in civilized nations."

[1] Address before National Academy of Sciences, April 30, 1924.

It referred to the local timber scarcity already threatened, and gave plain warning of the menace to national prosperity arising from the "universal neglect of reproductive measures."

Since the academy made its investigation in 1896, the national forest system which it aided so notably to create has expanded to a total of 157,000,000 acres in 27 states. The original policy of establishing national forests in the public domain has been supplemented by the purchase of forest lands on the watersheds of navigable rivers in the eastern states. About 30 states have launched forest policies of their own, embracing such features as the protection of wooded areas from fire, the creation of state forests and the encouragement of timber planting. And commercial reforestation by private land-owners has begun.

But while the past 30 years have witnessed real progress in forest conservation, they have also brought out in much bolder relief the serious proportions of the problem. The "local timber scarcity" of which the academy gave warning has reached a point where 28 states import a large part of the wood needed by their own population, from sources of supply which are steadily becoming more and more distant. Even our remote areas of virgin timber are dwindling steadily. We are depleting our forests four times as rapidly as they are being replaced. We have already become dependent upon foreign sources for more than half of the paper, or its raw materials, which are consumed in the United States. The timber famine is no longer a distant and theoretical danger; it is here.

Another phase of our forest problem is of well-nigh equal gravity; namely, the idleness of land. Timber crops represent the only productive use of one fourth of the soil of the United States. The idle or partially idle condition of much of this land has already resulted in extensive rural depopulation, in the disappearance of local industries and in land and community bankruptcy. From many economic standpoints, not to mention the need of the United States for generous areas of forest for the sake of their social and recreational value, we are more and more clearly recognizing the accuracy of President Roosevelt's foresight when he referred to forestry as one of the most vital internal problems of the United States.

The most effective action which the nation has yet taken to meet this situation has been the extension of public forest ownership, largely along the lines advocated 30 years ago by the National Academy of Sciences. The national and state forests now embrace about one fifth of the forest-growing soil in the United States. It is more and more apparent, however, that this solution, while effective so far as it goes, can at best prove but partial and inadequate. Nothing short of the productive use for growing timber of all our forest land, the four fifths remaining in private ownership no less than the one fifth which has been acquired by public agencies, will meet our national requirements. Forestry must be made part and parcel of our national scheme of land use. The growing of timber must assume its necessary place, in the use of our soil, side by side with the growing of food crops. Nothing less than this will suffice. And it is encouraging to note that the law of supply and demand is rapidly making the growing of timber practicable as a matter of cold business. There are no fundamental reasons why, with the right technical guidance, the commercial and industrial energies of the country can not enter this field on a large scale.

Passing by many phases of organized public and private effort which are necessary to accomplish this result, I wish to speak particularly of its scientific background and its demands upon the scientific agencies of the United States. We must bring about an evolution in the land practice and forest industries of this country, and we must do so in the shortest possible time. The essence of this evolution is the development and application of technical methods, first in growing timber and, secondly, in utilizing it for the necessities of life which timber alone can supply. It is an evolution that will be halting and inadequate unless a comprehensive scientific foundation can be provided for it. The very variety of our soil conditions and forest types, the very variety of industrial processes for converting timber into the commodities required by a civilized nation, both emphasize the necessity for thorough-going research in order that this development may be soundly conceived and wisely directed.

In the first place, we must create the science of forest culture in America. While certain principles and much in the way of practical experience can be borrowed advantageously from the old world, the silviculture of the United States must be an indigenous product. It must be created directly from the soil, climatic and biological factors with which we have to deal.

The range of problems in this field is enormous. We must know the more or less distinct growth requirements of 200 commercial species of trees. We must master both the scientific laws and the effective practice governing their natural regeneration and their artificial propagation. We must find out what rotations or growth periods produce the most profitable crops; and we must apply this knowledge to commercial products of infinite variety, ranging from the distillation wood of the chemical plant or the pulp wood of the paper mill to the high-grade lumber required by the furniture factory. And we must determine the timber yields obtainable, under an immense number of possible cultural methods, since upon them all forestry practice necessarily is predicated.

The United States Forest Service has set its hand

to this task through the creation of a chain of forest experiment stations dealing with these problems in each of our principal forest regions. Thus far five stations of this nature have been launched with reasonable provision for effective work; but to answer the problems in forest practice which exist on our 470,000,000 acres of forest growing land, embracing almost every combination of soil, climate and biological association to be found in the world, we need at least ten well-equipped forest experiment stations. Already we are unable to answer many questions which land-owners interested in commercial reforestation are asking. Other agencies, particularly a number of universities which offer instruction in forestry, have entered the same field, and there can not be too many of them. We stand at the threshold of a period of rapid progress in timber growing, but it can not be expected that such progress will be either rapid or sound unless the fundamental scientific background is provided.

A second great field of research deals with economy in the use of timber. Wastefulness in the exploitation of America's forests and in the manufacture of their products is proverbial. It is an inheritance from the very abundance and cheapness of our virgin forests. A thousand feet of timber saved in manufacturing processes is equal to a thousand feet of timber grown in the woods; and the necessities arising from a shortage of timber already acute make it imperative that every possible saving be effected. What we already know in this field, if fully and widely applied, would permit reducing the present drain upon our forests by 20 or 25 per cent. without diminishing the volume of useful products obtained from them. More economical use of wood is just as essential a part of forest conservation as the growing of new crops of timber. It is just as essential a part of the evolutionary process we must go through as the development of an American silviculture. Sweden, for example, produces about 3,000,000 tons of paper or paper-making materials annually, almost wholly as a by-product from the manufacture of lumber. This illustrates the sort of industrial evolution which is imperative in the forest utilization of the United States.

Again are we confronted with an enormous range of scientific problems, in chemistry, physics and biology, no less than in the mechanics of timber manufacture. The chemistry of wood offers enormous possibilities, not only in the manufacture of fiber products and distillates, but also in utilizing waste and substituting new forms of wood for old forms which only virgin forests could supply. Large savings can be accomplished through the impregnation of timber with fungicides. There is still much to be learned about the mechanical properties of timber, with their bearing upon economy in the use of wood for structural purposes. There is still much to be learned about the seasoning of timber and other physical properties with their direct bearing upon the elimination of wastes that are now enormous. We are just beginning to secure an integration of different wood-using industries through adapting primary manufacture to the requirements of final fabrication with a minimum of loss, and converting the waste from one industry into useful raw material for other industries.

Research in this field is concentrated largely at the Forest Products Laboratory in Wisconsin, which already has made notable contributions to the conservation of our timber supply, but whose efforts are small enough when contrasted with an annual consumption of about 53,000,000,000 board feet of wood and a preventable waste of fully one fourth of that amount.

Still a third line of research should be mentioned. We can not educate the American public to a full understanding of its forestry problem or provide the background needed both for our national policy and for commercial developments without a comprehensive study of the essential economic facts as to our forest resources and use of wood. We need a much more accurate inventory of the resources available, not only in merchantable timber but in areas of young forest and in potential forest-growing land. We need a much more accurate survey of the essential needs for timber; first, by regions with a view to alleviating regional shortages; second, by industries with a view to promoting the most sound industrial development; and third, for the country as a whole. We need to know currently what is happening in timber costs and values, because of their direct bearing upon reforestation by either public or private agencies. We need to study closely the great transportation problem in its bearing upon timber costs and regional depletion. Furthermore, we are coming to grips with the broad problem of effective use of our land. We must develop a national program of land use, in which timber culture is fitted into its proper place. This can not be accomplished efficiently without a deal of study along the lines of land classification in order that the use of our soil may be soundly and intelligently guided.

These are all relatively new problems to the people of the United States. General concern is now manifest over the evident shortage of timber, which has become so clear that it can no longer be ignored; but we are still far short of a national comprehension of the magnitude of our forest problem and particularly of the necessity of a sound scientific approach to its various phases. As always under such circumstances, the public is impatient for immediate results. Something must be done right away; and the average American has the idea that an immediate cure for these pending ills can be accomplished through the enactment of some law or another. In the impatience

for immediate action, that is bound to increase rapidly as the pinch becomes harder, there will be a very inadequate comprehension of the need for a vast amount of painstaking research before sound progress can be assured; and there will be but inadequate support for the basic scientific work that is essential. One of the most urgent requirements in solving our forestry problem is a national policy, or program, of forest research, conceived not for the needs of the moment but for the needs of the future, well supported and sustained without interruption.

The National Academy of Sciences aided effectively 30 years ago in placing before the country the main lines of action which were essential at that time. I believe that the academy could now perform a national service of equal value if it could resurvey the forest problem of the United States as it presents itself to-day; and particularly if, as an impartial and authoritative scientific body, it could direct its survey primarily toward the scientific background, or foundation, that is so essential to an effective solution of this problem. It would be a splendid undertaking if the academy could review the present status of forest research in the United States, point out the essential phases in its future development, and in some measure at least, outline what our national program of forest research should be to cover adequately the needs of the situation. It would also be a splendid thing if the academy could bring to this program, as a sustained national undertaking enlisting all the agencies available, the support of its recognized leadership in the scientific progress of the country. It is hard for me to conceive of any more useful function in the furtherance of national welfare and in line with its own traditions that this organization might assume.

W. B. GREELEY

U. S. FOREST SERVICE

LUTHER EMMETT HOLT

L. EMMETT HOLT was born at Webster, N. Y., on March 4, 1855. He prepared for college at the Webster and Marion Academies, and entered Rochester University at sixteen years of age, graduating with honor in the class of 1875. He taught for a year in the Riverside Institute at Wellsville, N. Y., then began the study of medicine at the Buffalo Medical College, continuing his course and in 1880 securing his degree at the College of Physicians and Surgeons in New York. After serving his interneship in Bellevue Hospital he began the practice of medicine in New York City, choosing the diseases of children as a promising field.

Dr. Holt began the practice of medicine in those wonderful years when physics and chemistry and biology were entering a new period of enlightenment, and medicine, under the new conceptions of infection and its incitants, was pressing forward into fresh fields of study and achieving thrilling conquests of disease.

He early realized the importance of pathology and out of the opportunities offered by his services at the Northwestern Dispensary, the New York Infant Asylum, the Foundling and the Nursery and Child's Hospitals, he won, first hand, much of the knowledge and experience making possible the creation of his masterly treatise on the diseases of infancy and childhood, which so greatly contributed to the establishment of pediatrics in this country on a firm foundation, and won for him a high place in the science and the art of medicine.

At the Babies' Hospital, which he was so largely instrumental in developing, he was for many years physician-in-chief. Here a long series of studies on infant nutrition was carried forward under his direction and many contributions of value in many subjects relating to pediatrics witnessed the high standing and the exceptional efficiency of this remarkable institution.

After eleven years of service in the faculty of the Polyclinic Hospital, in 1901 Dr. Holt became professor of the diseases of children at the College of Physicians and Surgeons, succeeding Abraham Jacobi. This chair he held for twenty years, securing, through his remarkable knowledge, his capacity for marshalling in simple phrase the gist of complex conditions and processes, his enthusiasm, his unfaltering devotion to his work and aims, the admiration and loyalty of his many students and his place among the great teachers of his time.

Dr. Holt was a member of the original board of directors which in 1901 organized the Rockefeller Institute for Medical Research and served as its secretary until his death in 1924.

As secretary of the board of scientific directors and of its executive committee Dr. Holt cherished a keen interest in the progress and affairs of the institute and brought to its service his large experience as a practitioner of medicine and his devotion to the advancement of science. His leadership and his high attainments in the field of pediatrics have been of great value in the councils of the institute in such of its researches as relate to the various diseases and handicaps of child life. The maintenance of child health to which in so large a measure Dr. Holt devoted his later years kept him in touch with those aspects of child hygiene in which the institute maintains a continuing interest.

In the lulls, if such there were, of his busy life as practitioner and consultant, Dr. Holt found time and opportunity for many forms of public service. He was concerned in the affairs of the New York

Academy of Medicine; he was a member of the advisory board of the department of health of the city of New York; he was upon the advisory council of the Milbank Memorial Fund; he was one-time editor of the *Journal of the Diseases of Children;* he was twice president of the American Pediatric Society; he was trustee of the University of Rochester.

As the author of a small book on the care and feeding of children, Dr. Holt brought comfort, as well as enlightenment and wise counsel, to a host of young mothers in the land. In the later years of his life, he was a leading spirit in the health crusades of the American Chi'd Health Association which has brought the tenets and ministrations of Hygeia in comprehensive and entertaining fashion into the minds and lives of a multitude of delighted and appreciating youngsters.

In addition to his books, which ran through several editions, Dr. Holt published many records of his researches and observations. He was the recipient of many academic honors and testimonials of appreciation and esteem. He was a clear thinker, a wise and helpful counsellor. He was inspired with eager enthusiasm for his various interests. His memory was keen, his energy unflagging, his devotion to his calling boundless.

During the last three months of 1923, at the invitation of the China Medical Board of the Rockefeller Foundation, Dr. Holt was visiting professor of pediatrics at the Union Medical College in Peking; eager and successful as usual in his teaching, and making many friends. Here his failing heart laid down its task on the fourteenth of January, 1924. Then the world lost a leader in medicine, a friend of science, a prodigious worker, a good citizen, a benefactor of his fellow-men.

T. MITCHELL PRUDDEN

THE AMERICAN ASSOCIATION FOR THE ADVANCEMEMT OF SCIENCE

THE SPRING MEETING OF THE EXECUTIVE COMMITTEE

THE executive committee of the council of the American Association held its regular spring meeting at Washington on Sunday, April 27. There were three sessions, one in the forenoon, one in the afternoon and one in the evening. The following members were present: J. McK. Cattell, H. L. Fairchild, L. O. Howard, W. J. Humphreys, B. E. Livingston, D. T. MacDougal, G. A. Miller, H. B. Ward. Absent were Simon Flexner and W. A. Noyes. President Cattell was elected to act as chairman. The following items of business were transacted:

(1) The minutes of interim transactions by mail were approved.

(2) The interpretation of the constitution with regard to eligibility to fellowship was referred to a special committee on fellowship, to be appointed by the chair, with power when unanimous. The chair appointed Drs. Livingston, Howard and Humphreys to constitute this committee. It will prepare a series of statements to be used as a guide in determining the eligibility of members to fellowship and these statements are to be sent to the section committees.

(3) Dr. L. H. Baekeland, of Yonkers, N. Y., honorary professor of chemical engineering, Columbia University, president of the American Chemical Society, was elected vice-president for Section C (Chemistry), for the current year.

(4) It was voted that the American Association for the Advancement of Science is favorable to full cooperation with the following organizations and with their official affiliation with the American Association for the Advancement of Science, whenever they may so vote:

The American Electrochemical Society.
The American Ceramic Society.
The Paleontological Society of America.
The Mineralogical Society of America.
The American Society of Animal Production.
The American Public Health Association.
The American Philosophical Association.
The American Economic Association.
The American Sociological Society.
The American Statistical Association.
The American Civic Association.
The American Historical Association.
The American Philological Association.
The Modern Language Association.

Many of these organizations are now officially associated with the American Association for the Advancement of Science, and several of them have already intimated their desire to be affiliated. It is the aim of the association to include among the officially affiliated organizations all the main national societies that have to do with the research aspects of the advancement of science and education. The affiliated organizations take part in the control of association affairs through their representatives in the association council, who are also *ex-officio* members of the corresponding section committees. In recent years the association has become in great measure an affiliation of scientific organizations, and one of its chief aims is to aid these organizations and furnish a ready means for their cooperation toward the advancement of every field of science and that of science in general. The affiliated organizations have no financial responsibility toward the general association. They are invited to hold meetings with the rest of the associa-

tion, but no obligation in this respect is implied. Their members have the privilege of joining the association without paying the usual entrance fee, if they do so before the second October first after they become members of the affiliated organization, or before the second October first following the ratification of the affiliation of the latter.

(5) It was voted that the next volume of the Summarized Proceedings, with the directory of the American Association for the Advancement of Science members, shall be distributed at the following prices: $1.50 to members who pay in advance before January 1, 1925; $2.00 to members ($2.50 to others) who pay in advance between January 1, 1925, and the time of publication; $2.50 to members ($3.25 to others) who purchase the volume after publication. It is planned that the volume will be published in the summer or early autumn of 1925.

(6) An offer was unanimously and very gratefully accepted from a member of the association, who wishes his name withheld for the present, who will give to the association the sum of $5,000 to be devoted to five annual association prizes of $1,000 each for notable contributions to science, for the next five years. The first of these prizes will be awarded in connection with the next annual meeting, which opens on December 29, 1924, in Washington. Further announcements regarding this American Association prize will appear in SCIENCE.

(7) It was voted that the sum of $500 be appropriated and disbursed from the appropriable funds of the treasurer's office for the zoological station at Naples, which is being reorganized.

(8) A communication and a suggested resolution from the Ecological Society of America, regarding a proposed Glacier Bay National Park, in Alaska, were considered and were referred to Dr. Ward as a committee of one, to be reported back to the executive committee, with recommendations, at the next meeting of the committee.

(9) In preparation for the approaching fifth Washington meeting of the association (next December), it was voted that members residing in the District of Columbia be solicited for donations toward a fund to care for the extra expenses of that meeting.

(10) It was voted that the Pacific Division be authorized to remit entrance fees of new members joining during 1924, who are members of any society affiliated with the division, even if the society is not affiliated with the American Association as a whole. This privilege is open during 1924 to all members of the organizations that are affiliated with the association as a whole.

(11) It was voted that the next meeting of the executive committee shall occur in Washington, on Sunday, October 12, 1924, beginning at 10:00 a. m.

B. E. LIVINGSTON,
Secretary

SCIENTIFIC EVENTS

MEMORIAL MEETING FOR THE LATE DR. BIGGS

ON April 29, the New York Academy of Medicine held a memorial meeting in honor of the Late Dr. Hermann M. Biggs. The speakers, all of whom had been intimately associated with Dr. Biggs and his work were: Dr. William H. Welch, director, Johns Hopkins School of Hygiene and Public Health, who presided; Dr. Walter B. James, emeritus professor of medicine, Columbia University; Dr. George D. Stewart, president of the Academy of Medicine; Dr. William H. Park, director of the Bureau of Laboratories, New York City Health Department; Dr. Matthias Nicoll, Jr., state commissioner of health; Mr. Homer Folks, secretary of the State Charities Aid Association; Mr. Ira A. Place, vice-president of the New York Central Railroad, and Dr. Livingston Farrand, president of Cornell University.

Dr. Welch spoke briefly of the lifework of Dr. Biggs, emphasizing the broad general medical training which he had, and which so well fitted him for his success in later years, both in public health work and private practice.

Drs. Park and Nicoll outlined the progress made under Dr. Biggs by the City and State Health Departments, respectively, and Mr. Folks spoke of his association with private public health organizations.

Dr. Farrand as the last speaker paid a high tribute to the character of Dr. Biggs, when he said in part: "The disorder of a war-torn civilization is characterized by a reign of prejudice and an exhibition of loose thinking and hasty judgment, which is nowhere more noticeable than in this complacent democracy of ours. It is minds and characters like those of Hermann Biggs of which this country stands most in need."

THE INTERNATIONAL MATHEMATICAL CONGRESS

AN International Mathematical Congress will be held in Toronto from August 11 to 16. International gatherings of mathematicians have previously been held in Zurich (1897), Paris (1900), Heidelberg (1904), Rome (1908), Cambridge (1912) and in Strasbourg (1920). The North American Continent is for the first time the meeting place of such an assembly. It is estimated that the attendance from

Europe will exceed one hundred, eighteen of whom will come from France, while it is expected that mathematicians in Canada and from the United States will be present in large numbers.

The Organizing Committee has tried to notify all those likely to be interested, resident in countries adherent to the Mathematical Union, or eligible for adherence thereto. In all, some six thousand notifications have been sent out, and a large number of universities and learned societies have been invited to be represented by delegates. Among those bodies which will be represented are the London Mathematical Society, Comité national français de Mathématiques, the American Mathematical Society, the University of Paris, the Polish Academie des Sciences, the British Admiralty, the American Association for the Advancement of Science, the National Physical Laboratory, the Bureau of Standards (Washington), the Royal Astronomical Society, the Institution of Naval Architects, the Institution of Electrical Engineers, the Actuarial Society of America, and many American universities and observatories.

The congress is being held under the auspices of the University of Toronto and the Royal Canadian Institute, and will be conducted in accordance with the regulations of the International Research Council. Professor J. C. Fields, F.R.S., president of the Royal Canadian Institute, is chairman of the Organizing Committee, and the other members of the committee are Sir Robert Falconer, K.C.M.G., president of the University of Toronto; Professor A. T. Delury, Professor J. C. McLennan, F.R.S., Professor C. A. Chant, Mr. T. H. Hogg, Dr. J. S. Plaskett, F.R.S., Professor M. A. Mackenzie, Professor E. F. Burton, Mr. J. Patterson, Mr. W. P. Dobson, Wing-Commander E. W. Stedman, F.R.Ae.S., and Professor J. L. Synge (Secretary). An Editorial Committee has been organized, with Professor Fields as chairman.

The congress will meet in the following sections:

Section I: Algebra, Theory of Numbers, Analysis.
Section II: Geometry.
Section III: (a) Mechanics, Mathematical Physics.
(b) Astronomy, Geophysics.
Section IV: (a) Electrical, Mechanical, Civil and Mining Engineering.
(b) Aeronautics, Naval Architecture, Ballistics, Radiotelegraphy.
Section V: Statistics, Actuarial Science, Economics.
Section VI: History, Philosophy, Didactics.

It will be observed that this scheme of sections differs from those adopted at former congresses in the additional attention devoted to the applications of mathematics. It has been devised in order to secure in the sphere of applied mathematics full opportunity for consideration not only of those questions whose interest is purely scientific, but also of practical problems of engineering whose solutions contribute directly to the cause of material progress.

The Organizing Committee would be obliged if those who expect to attend the congress would notify the secretary to that effect, stating their order of preference in accommodation from a choice of hotel, boarding house or university residence. Abstracts of papers intended for presentation should be in the hands of the secretary well in advance of the meeting.

Further information may be obtained from Professor J. L. Synge, secretary of the Organizing Committee, International Mathematical Congress, Royal Canadian Institute, 198 College Street, Toronto, Canada.

CHEMISTRY AT THE TORONTO MEETING OF THE BRITISH ASSOCIATION

AMONG overseas chemists who will be present at the Toronto meeting are the following:

President of Section B: Sir Robert Robertson, chemist to His Majesty's Government.

Vice-president: Professor F. G. Donnan, professor of inorganic and physical chemistry, University College, London.

Recorder: C. H. Desch, professor of metallurgy in the University of Sheffield; vice-president of the Faraday Society and member of the Council of the Chemical Society.

Sir Henry Gauvain, medical superintendent to Lord Mayor Treloar's Cripples' Hospital and College. Will speak on "Light therapy" in the symposium on "Vitamins and the relation of light to their action."

E. C. Baly, professor of inorganic chemistry in the University of Liverpool; will take part in discussion on "Photochemistry" at Saskatoon during the western trip.

W. A. Bone, chief professor of chemical technology in the Imperial College of Science and Technology.

Alexander Findlay, professor of chemistry in the University of Aberdeen.

Harold Dixon, professor of chemistry in the University of Manchester.

J. C. Irvine, principal of the University of St. Andrews.

Sir Max Muspratt, British chemical manufacturer.

K. J. P. Orton, professor of chemistry in the University of Wales; member of council of the Institute of Chemistry and Chemical Society, and member of the General Committee of the British Association.

Sir William J. Pope, professor of chemistry in the University of Cambridge.

E. K. Rideal, Owen-Jones lecturer in physical chemistry in the University of Cambridge, 1919–20 visiting professor of physical chemistry at the University of Illinois.

N. V. Sidgwick, fellow of Lincoln College.

Arthur Smithells, professor of chemistry and pro-vice chancellor of University of Leeds; chief chemical adviser to G. H. Q. during the war.

H. B. Baker will speak on "Highly dried liquids."

F. D. Chattaway, lecturer and fellow, Queens College, Oxford; member of the court, University of Wales.

A. G. Green, director of research, British Dyestuff Corporation.

TESTIMONIAL BANQUET TO DOCTOR GEORGE H. SIMMONS

IN recognition of the long and valuable service to scientific medicine of Dr. George H. Simmons, for twenty-five years editor of *The Journal* of the American Medical Association, the undersigned committee of physicians is arranging for the painting of his portrait and a testimonial presentation banquet to be held in the Congress Hotel, Chicago, Monday evening, June 9, at six-thirty o'clock. Special invitations have been issued to the officers of leading medical organizations, etc. It is desired to invite also all fellows of the American Medical Association, educators and scientists who may wish to join in this recognition of Dr. Simmons's service. In order to provide adequately for those expecting to attend, reservations should be made promptly. The cost will be $10.00 per plate and checks should be sent to Dr. Ludvig Hektoen not later than June 5, at 37 S. Wood Street, Chicago.

COMMITTEE

George Blumer, New Haven.
Hugh Smith Cumming, Washington, D. C.
Harvey Cushing, Boston.
John Blair Deaver, Philadelphia.
George Dock, Pasadena.
Charles Phillips Emerson, Indianapolis.
Seale Harris, Birmingham.
Ludvig Hektoen, Chicago.
Charles Franklin Hoover, Cleveland.
Merritt Weber Ireland, Washington, D. C.
Donald Macrae, Jr., Council Bluffs.
Rudolph Matas, New Orleans.
Charles Horace Mayo, Rochester, Minn.
Harvey Gilmer Mudd, St. Louis.
Henry Sewall, Denver.
George David Stewart, New York.
Edward Rhodes Stitt, Washington, D. C.
Holman Taylor, Ft. Worth.
William Sidney Thayer, Baltimore.
Victor Clarence Vaughan, Ann Arbor.
John Alexander Witherspoon, Nashville.

PRIZE OF THE AMERICAN ASSOCIATION

IT will be remembered by all readers of SCIENCE that a member of the American Association for the Advancement of Science provided $1,000 for a prize for a notable contribution to science presented at the meeting in Cincinnati celebrating the seventy-fifth anniversary of the association. The same member, who wishes to withhold his name for the present, has undertaken to provide for a similar prize to be awarded each year for a term of five years beginning with the Washington meeting next December. It is the preference of the donor that the prize be not given in two successive years in the same major division of science, but there is no restriction on the council of the association in regard to the manner in which it shall be awarded. The prize for last year was awarded at Cincinnati to Professor Roland B. Dixon, of the University of Chicago, for papers presented before the section of mathematics and the American Mathematical Society by a committee of which Professor Nevin E. Fenneman, professor of geology in the University of Cincinnati as chairman. Further announcements concerning the prize to be awarded for a paper presented at the Washington meeting will appear in SCIENCE and in the preliminary announcement of the Washington meeting.

SCIENTIFIC NOTES AND NEWS

AT a stated meeting of the Franklin Institute of Philadelphia, held on May 21, a Franklin medal and certificate of honorary membership were awarded to Sir Ernest Rutherford, Cavendish professor of physics in the University of Cambridge. A statement concerning the work of Sir Ernest was made by Dr. Joseph S. Ames, of the Johns Hopkins University, and the medal was received by H. G. Chilton, counsellor of the British Embassy. A second Franklin medal and certificate of honorary membership were awarded to Dr. Edward Weston, president of the Weston Electrical Instrument Company, the statement in regard to whose work was made by Dr. Frank J. Sprague, of New York City. Following the presentation of the medals a paper by Sir Ernest Rutherford entitled "Early days in radio-activity" was read by Professor Ames, and Dr. Weston read a paper entitled "Some electrical reminiscences."

THE Pulitzer prize of Columbia University for the best American biography teaching patriotic and unselfish services to the people, illustrated by an eminent example, excluding, as too obvious, the names of George Washington and Abraham Lincoln, $1,000 was awarded to "From immigrant to inventor," by Professor Michael Pupin, of Columbia University, published by Charles Scribner's Sons, New York, 1923. The prize for the best example of a reporter's work during the year, the test being strict accuracy, terseness, the accomplishment of some public good commanding public attention and respect, $1,000 has been awarded to Magner White for his story on the eclipse of the sun, published in the *San Diego Sun*, on September 10, 1923.

PROFESSOR GEORGE EDMUND DE SCHWEINITZ, of Philadelphia, was presented with a plaquette in recog-

nition of his eminent services to science, after a lecture before the Congress of the French Ophthalmologic Society on May 13. Dr. de Schweinitz was received by Dr. Henri Roger, dean of the faculty of medicine of the University of Paris, and was introduced by Dr. Dor, of Lyons, president of the congress.

THE Rosenberger Medal of the University of Chicago, "conferred for benefit to humanity,'" will this year be awarded to Dr. F. G. Banting for the discovery of insulin.

FOR distinguished work in the field of plant introduction, Dr. David Fairchild, agricultural explorer in charge of foreign plant introduction of the U. S. Department of Agriculture, has been awarded, through the Société Nationale d'Acclimatation de France, the silver-gilt medal of the French Ministry of Agriculture.

HOWARD C. PARMELEE, for the past seven years editor of *Chemical and Metallurgical Engineering*, a McGraw-Hill publication, was elected president of the American Electrochemical Society at its recent meeting in Philadelphia.

M. L. CROSSLEY was elected president of the American Institute of Chemists at the second annual meeting held in New York on April 28.

SIR GEORGE LEVESON GOWER, for sixteen years British commissioner of woods and forests, retired on May 18, and is succeeded by Mr. A. S. Gaye, secretary of the department.

JOSEPH BURTT DAVY, research student at Christ's College, who was assistant in the U. S. Department of Agriculture in 1902, and later government agrostologist and botanist of the Department of Agriculture of the Union of South Africa, has been approved for the degree of Doctor of Philosophy in the University of Cambridge. He submitted a dissertation entitled "The vegetation and flora of the Transvaal and Swaziland."

PROFESSOR VITO VOLTERRA, professor of mathematics and physics at the Royal University, Rome (Italy), will represent the Societa Italiana per il Progresso delle Science at the meeting of the British Association for the Advancement of Science to be held in Toronto during August 1924. Professor J. Playfair McMurrich, professor of anatomy and dean of the graduate school in the University of Toronto, will represent the Academy of Natural Sciences of Philadelphia.

DR. OTTO C. GLASER, professor of biology at Amherst College, will be absent on leave during the coming year. He plans to go to Monaco and later to the Marine Biological Laboratory at Naples, and to Plymouth.

PROFESSOR W. S. COOPER, of the department of botany of the University of Minnesota, will be on leave during the academic year 1924–25, which he will spend in ecological research on the Pacific Coast.

AN expedition organized by the American Museum of Natural History under the leadership of Dr. G. Clyde Fisher, curator of visual instruction, sailed on May 10 for Gothenburg, to make a study of the educational institutions of Sweden. Dr. Fisher will be accompanied by Carveth Wells, explorer and lecturer. After studying the schools and universities of Sweden, the expedition will visit Lapland where a pictorial record of the life of the Lapps will be taken with still and motion-picture cameras. A record of plant and animal life also will be made.

THE National Geographic Society has resumed its explorations in prehistoric Pueblo Bonito, Chaco Canyon National Monument, New Mexico. Pueblo Bonito is one of the most important and perhaps the most famous ruin north of Mexico. The society's explorations began in 1921 and it is hoped to conclude them during the excavation season of 1925. As heretofore, the work will be under the direction of Neil M. Judd, curator of American archeology, U. S. National Museum.

DR. GEORGE OTIS SMITH, director of the Geological Survey, on May 15 testified before the Senate Oil Committee that he had a prominent part in initiating the program adopted during the Taft Administration, of setting aside oil lands to insure a future fuel supply for the navy, and that he was not consulted about the Sinclair and Doheny leases before they were executed by Secretary Fall.

DR. GEORGE F. SWAIN, professor of civil engineering at Harvard, will be the chief speaker at the graduation exercises of the Worcester Polytechnic Institute on June 6. Professor Swain will speak on "How to become a successful engineer."

DR. J. MCKEEN CATTELL will give the commencement address at the University of Arizona on May 28, and will in June attend the meeting at Stanford University of the Pacific Division of the American Association for the Advancement of Science.

DR. G. H. SMITH, professor of bacteriology at Yale University Medical School, spoke on May 19 before a large group of members of the Central New York Branch of the Society of American Bacteriologists, at Geneva, N. Y. Dr. Smith's subject was "The history of the bacteriphage and its uses clinically." The Central New York Branch has started the custom of introducing speakers dealing with special topics at

each annual meeting, and Dr. Smith's lecture was the first of a series of talks dealing with special subjects.

A bust of Louis Pasteur by Arinson was presented to the New York Academy of Medicine on May 15 by A. Nelson Lewis, of New York, in memory of Ward McAlister, the father of the late Mrs. Lewis. The address was made on behalf of Mr. Lewis by Dr. William H. Welch, of the Johns Hopkins University, and the bust was accepted for the academy by Dr. Linsly R. Williams, director. A. Brouzet, acting consul general of France, spoke on behalf of his country. This is one of three busts of Pasteur made by Arinson. One of the others was recently presented to the Pasteur Institute by the French Government, and the third is owned by the Pasteur family.

George Hubbard Pepper, anthropologist and archeologist, who for more than ten years was connected with the Heye Foundation of the Museum of the American Indian, died on May 13, aged fifty-one years.

Miss Louise Frances Cowles, professor emeritus of geology and mineralogy at Mount Holyoke College, died at Peterson Lodge, in South Hadley, on May 6. She had been connected with the department for a period of thirty-seven years prior to her retirement in 1904.

Surgeon-Colonel R. J. Reece, C.B., senior medical officer of the British Ministry of Health, and formerly president of the Epidemiological Society of London, died on April 20, aged sixty-one years.

Nature reports the death of Mr. H. Deane, a distinguished botanist who was president on two occasions of both the Royal and the Linnean Societies of New South Wales, and also a well-known engineer, on March 12, aged seventy-seven years.

Dr. Siegmund Gabriel, honorary professor of chemistry in the University of Berlin, has died at the age of seventy-three years.

The one hundred and twenty-eighth regular meeting of the American Physical Society will be held at Stanford University, in affiliation with the Pacific Division of the American Association for the Advancement of Science. Unless the length of the program necessitates a change, the general session of the American Physical Society for the presentation of papers will be held on Thursday, June 26, beginning at 10 a. m. On Wednesday evening, June 25, the American Association for the Advancement of Science will hold a public reception preceded by an address by Dr. David Starr Jordan. On Friday, June 27, there will be a trip to the Lick Observatory and Mount Hamilton.

The twenty-seventh annual meeting of the American Society for Testing Materials will be held from June 24 to 27 at Atlantic City, N. J.

The second annual meeting of the Virginia Academy of Science was held in Lexington, Virginia, on May 2 and 3. The faculty of Washington and Lee University were the hosts for the meeting and a most cordial welcome was extended to the visiting members of the academy. The meetings were held in the physical laboratory of the university, and the department of physics supplied such apparatus as was needed to illustrate the papers read before the members. On the evening of May 2, a public meeting was held in the Robert E. Lee Memorial Chapel, at which Dr. Henry Louis Smith, president of Washington and Lee University, gave an address of welcome, to which Dr. I. F. Lewis, of the University of Virginia, president of the Virginia Academy, replied. Dr. S. C. Lind, of the U. S. Bureau of Mines, then delivered an address on Radio-activity. Dr. James Lewis Howe, dean of the faculty of applied science of Washington and Lee University, was elected president for the coming year, and Dr. E. C. L. Miller, of the Medical College of Virginia, Richmond, was reelected secretary. Richmond was chosen as the place at which the next meeting will be held, the Medical College of Virginia and Randolph-Macon College asking that they be the host of the academy on this occasion.

The seventeenth annual conference on Weights and Measures will be held at the Bureau of Standards on May 26, 27, 28 and 29. The program for the meetings includes many important subjects, such as specifications and tolerances for vehicle tanks, taximeters, and fabric measuring devices. The recent decision of the United States Supreme Court in relation to the Nebraska Standard-Weight Bread Law will be considered, particularly as to its bearing upon similar laws already enacted in other states. All weights and measures officials, railroad scale men, representatives of weighing departments, and others interested in any phase of weights and measures activity are cordially invited to attend the conference. No formal credentials are necessary on the part of those attending.

The second World's Poultry Congress was opened on May 10, at Barcelona, by the King of Spain. There was an official reception of delegates from England, Scotland, Australia, New Zealand, Canada, Egypt, India, South Africa, Straits Settlements, the United States, Argentina, Brazil, Uruguay, Cuba, Peru, Belgium, France, Holland, Denmark, Italy, Czechoslovakia, Switzerland, Poland, Russia, Rumania, China, Mexico, Colombia, Ecuador and Chile. During the following week the several sections met daily for the reading and discussion of papers, and

on May 17, the delegates left for Madrid, where the congress closed on May 19.

THE fourth congress of the British Institute of Transport will be held at Bristol from May 29 to May 31. The president, Sir Joseph Broodbank, will receive the delegates and visitors on May 28, and the following morning the Lord Mayor of Bristol will open the congress and extend a civic welcome to the delegates. Papers will be read on "The port of Bristol: past and present," "The problem of road surfaces with regard to mechanical transport," "Freight-train formations," and "The next five years of aerial transport." Visits will be made, among other places, to the Avonmouth Docks, the City of Bath, the works of the Great Western Railway at Swindon, and the various works in Bristol. In connection with a visit to the Severn Canals, the Mayor of Gloucester hopes to receive the party on arrival at Gloucester.

THE department of tropical medicine of Harvard University has recently received a gift of ten thousand dollars from Mr. Herman A. Metz, of New York City, for investigations with especial reference to the study and treatment of framboesia. These studies are to be carried out particularly in the Philippine Islands. The department is also in receipt of two other anonymous gifts, each amounting to ten thousand dollars, for medical research in connection with tropical medicine.

A NEW research farm of 350 acres has been placed free of cost at the disposal of the University of Leeds by Mrs. Ellis, widow of the Right Hon. John E. Ellis. The farm is at Wrea Head, Scalby, near Scarborough, and research in milk production is already being conducted there by the university.

THE Medical Schools of the Johns Hopkins University, Cornell University, Columbia University and New York University, at the request of the Surgeon-General of the Public Health Service, are giving courses at Columbia this summer on "Public health and preventive medicine" for training public health workers.

As adopted at the meeting of the Board of Trustees at its meeting in Ithaca on April 26, the total budget for the endowed colleges at Ithaca will, for the year 1924–25, be in excess of two million dollars. This is the first year that mark has been reached. The exact figure is $2,068,734.95, as compared with $1,979,-115.95 for the current year. These totals cover all expenses of operation of the university except for the colleges of Agriculture and Veterinary Medicine, which are supported by appropriations from the State of New York and the Federal Government. The budget of the College of Agriculture, based on the appropriations of the State Legislature, amounts to $1,-755,194.11. The budget of the Medical College in New York was also adopted with higher figures than ever before, $370,365.08. The total for the current year is $339,540. A further appropriation of $252,-472.72 was voted for the Cornell University Medical College Clinic, which is practically a self-supporting activity.

IN addition to Mrs. Sherrill's gift of $50,000 to the New York and Bellevue Hospital Medical College, a donation is announced of $40,000 from the estate of Mrs. Egbert LeFevre, widow of a former dean of the college, who stipulated that $25,000 should go to the Egbert LeFevre Memorial Library, and $15,000 to the Egbert LeFevre Deanship Fund. The sum of $11,000 has also been received for the Medical College Dispensary Endowment Fund. Mrs. B. Fleishmann Holmes has given $2,500 for the campaign fund and $5,000 for work in therapeutics, and the Cardiac Clinic received a gift of $1,000 from Mrs. William K. Vanderbilt.

AT a meeting of the board of trustees of the American Pharmaceutical Association, in Washington, on December 7, a committee of five was appointed to arrange for raising $500,000 to erect a building to provide for the activities of the American Pharmaceutical Association and afford facilities for representatives of all the national drug trade associations. The association already has numerous exhibits for a museum and nucleus for a pharmaceutical library. It also has the promise of a gift to equip a research laboratory, but has no place to house this equipment.

SIR JOHN RUSSELL, director of the Rothamsted Experimental Station, Harpenden, England, has recently returned from a special mission to the Sudan. During his three-month tour of this section he has been engaged in advising the Sudan government on its agricultural research policy with particular reference to the suitability of the region for cotton culture. During this time careful studies were made into the possibilities of conducting scientific research and the establishment of an experimental station. The extent of the development plan is indicated by the fact that the first instalment of the great irrigation scheme in the Gezira plain, south of Khartoum, that is expected to come into operation in the autumn of 1925, will involve 300,000 acres. The total irrigable area of the province, however, amounts to some 3,000,000 acres. The investigation has particularly emphasized the comparative freedom of the region from fungous diseases and its unique isolation against natural invasion by such fungi as well as insects.

THE medical correspondent of the London *Times* writes: "An investigation into the comparative hy-

gienic merits of paper money and coin has recently been carried out in Berlin. The results are published in the *Archiv für Hygiene*. In commenting on them the *Lancet* states that 'infectious diseases may be spread by paper money more frequently than by any other article in use among the people.' It was found that coined money is innocuous, owing to the self-disinfecting action of the metal itself, and because its small, smooth surface prevents the development of germs. 'The dirtiest piece of copper is, from the standpoint of a bacteriologist, better than newly-issued paper money.' In post-war banknotes for some time in circulation up to 143,000 bacteria were found. In pre-war notes the highest find was 3,000 bacteria. The post-war note is, of course, much more frequently handled than were the notes of the pre-war period. The notes manufactured of 'laid' paper were the worst offenders, as germs tend to stick to them. The investigator studied the vitality of the germs and found that *streptococci*—the germs of blood and other poisonings—were virulent 54 hours, while enteric fever bacilli lived 11–96 days. Dysentery germs lived 17–52 days."

UNIVERSITY AND EDUCATIONAL NOTES

STUDENTS of the International Y. M. C. A. College at Springfield, Mass., have pledged approximately $30,000 to the $2,500,000 endowment and expansion fund of the college. The undergraduate pledge brings the total amount now subscribed to the fund up to $1,523,935 with $976,065 yet to be raised before the campaign ends July 1, 1925.

JOINT action by the trustees of the Johns Hopkins University and the Johns Hopkins Hospital was taken on May 14, in the appointment of a joint committee headed by Dr. Frank J. Goodnow, president of the university, to bring into closer association the two institutions. The joint committee is charged with the responsibility of surveying and providing for the needs of the two institutions in connection with the university's coming semi-centennial, in 1926.

DR. W. S. LEATHERS, executive officer of the Mississippi State Board of Health and dean of the University of Mississippi School of Medicine, has accepted the appointment of professor of preventive medicine in Vanderbilt University School of Medicine. He will take up his work at Nashville following a year of travel and study in Europe. Dr. Hugh J. Morgan, at present resident physician at the Hospital of the Rockefeller Institute, and Dr. C. Sidney Burwell, instructor in medicine at the Johns Hopkins Medical School, have been appointed associate professors of medicine.

AT Harvard University Dr. Frederick H. Verhoeff has been promoted to a professorship of ophthalmic research. Other promotions in the Medical School include: Dr. Joseph T. Wearn to assistant professor of medicine; Dr. Robert M. Green to assistant professor of applied anatomy; Dr. Frederick S. Burns to assistant professor of dermatology, and Dr. Benjamin White to assistant professor of bacteriology and immunology and preventive medicine and hygiene.

AT the University of Chicago, Associate Professor A. C. Lunn has been promoted to a full professorship of mathematics.

DR. W. KOEHLER, professor of psychology at the University of Berlin, will lecture at Clark University during the second half of the coming academic year.

DISCUSSION AND CORRESPONDENCE

DALTON AS A NAME FOR THE UNIT OF ATOMIC WEIGHT

THE unit of atomic weight is the only unit of measurement in wide use without a name, and a suitable name for it is often desirable for clear expression of ideas. Especially is such a name desired when one is attempting to explain the concept of atomic and molecular weights to beginning students of chemistry. There was a time when the reality of atoms and molecules was questioned by some of the most eminent chemists, and therefore it was well to cultivate the concept of atomic weights as being merely relative weights. But that day has passed. The actual existence of atoms is universally accepted and therefore atomic weights are not only relative weights but are also actual weights. To continue to instruct a student that atomic weights are simply relative weights is not modern. If the concept of actual weights is to be presented it can not be done conveniently without the unit having a name. Because of the historical connection the name dalton is suggested. The atom of oxygen would weigh 16 daltons, hydrogen 1.008 daltons, etc.

Correlation of the dalton with the gram can be made through Avogadro's number. If 32 grams of oxygen contain 6.06×10^{23} molecules (12.12×10^{23} atoms) and if each atom is given a weight of 16 daltons, then one dalton $= 0.0_{23}1650$ grams.

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THE CARDIO-INHIBITORY CENTER

IN a recent article (*Journ. Physiol.*, vol. lviii, p. 168, 1923) on the localization of the vaso-motor center, Scott and Roberts refer to a paper (*Amer. Journ. Physiol.*, vol. xxxix, p. 149, Dec., 1915) on the cardio-inhibitory center by Bowman and myself and, by their remarks, indicate that they have not clearly understood our meaning. I desire to em-

phasize the fact that the other writers studied mainly vaso-motor effects, whereas we were concerned solely with cardio-inhibitory manifestations.

Bowman and I were the first to prove, by the method of unipolar faradization, that the cardio-inhibitory center is located in the dorsal vagus nucleus or ala cinerea. In a fresh specimen of the medulla oblongata of the dog the dorsal vagus nucleus (ala cinerea) is easily recognizable as a translucent-looking ridge, forming the lateral margin of the calamus scriptorius. Its position and appearance, as shown in Fig 1 of our paper, are identical with those indicated by Ellenberger and Baum in Fig. 165 in their "Anatomie des Hundes."

In localization experiments, like those described in our paper, it is essential that the excitability of the medulla oblongata be carefully maintained and that the current applied by the stigmatic electrode be of threshold value. Such a current yields definite cardiac inhibition from the dorsal vagus nucleus but fails to yield it from points 1 mm or less mesially or laterally to the nucleus. Slightly stronger currents applied to the nucleus elicit complete inhibition (Cf. Figs. 1, 2, 3 and 4 of our paper).

The view expressed above that the dorsal vagus nucleus is the source of the cardio-inhibitory fibers is held by the following authorities: Kohnstamm, van Gehuchten and Molhant, Herrick, Ranson, Tigerstedt (the latter in "Physiol. d. Kreislaufes," vol. 2, p. 424, 1921).

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SELF-FERTILIZATION IN NICOTIANA

IN a recent paper,[1] Morgan describes the removal of the "block" to self-fertilization in *Ciona* by the removal of the membrane around the egg, and compares it to experiments on the self-fertilization of self-sterile plants. In this connection, he states that "in self-sterile plants it has not been possible to demonstrate whether the pollen could fertilize the egg cell if it reached it."

Leaving aside the consideration that Morgan's work with *Ciona* may not be strictly comparable to that with self-sterile plants, there are certain unpublished data obtained by Dr. E. Anderson and myself which show that there is no "block" to self-fertilization in *Nicotiana*. It was conceived that, since self-sterility (according to East) is due to the fact that pollen tubes after self-pollination show no acceleration in growth, and hence fail to reach the ovary before the decay of the flower, if unopened buds were self-pollinated, additional time would be gained, and the pollen tubes might reach the ovary before the flower decayed. In several instances, pollinations were simultaneously made on the unopened bud, the first, and the second flowers[2] on the same branch of the panicle of both *Nicotiana alata* plants and hybrids between *Nicotiana alata* and *Nicotiana Forgetiana*. Seeds were set in 68 per cent. of the pollinations of unopened buds, whereas in the first flowers seeds were set in only 16 per cent. of the cases and in the second flowers there were none set. This indicates that the gametes are not incompatible, and that self-fertilization can take place in *Nicotiana* provided the male gamete can reach the egg.

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ST. LOUIS.

THE INFLUENCE ON FISHERIES OF THE WAR

IN many places the war made it necessary to discontinue fishing during a considerable period of time, as most of the active fishermen were called to the colors.

This involuntary cessation of fishing was most noticeable where the struggle took place actually within fishery districts, and it is interesting to study how it influenced the abundance of fish in such places after the close of the war. There was a marked influence in southeast Russia in the mouths of the Volga River, where the most important Astrakan fisheries are located. I recently met a business man interested in the Astrakan fishery who had received news from his locality to the effect that the run of every kind of commercial fish in the Volga River was an unusually large one last spring and fall; individual catches were of fabulous size. Nevertheless, the entire amount of fish landed was only half what it had been before the war. This latter is mostly due to absence of organization and fishing outfit (nets).

The unusually strong run of fishes here is rightly attributable to the fact that during 1918 to 1920 a civil war was in progress within the Astrakan government and nationalization of the fishery industry was effected, which resulted in stopping regular fishing. This enabled various fishes like vobla (*Leuciscus rutilus*, var.), Caspian herring, pike-perches and sturgeons to enter the Volga River untroubled by fishermen and to spawn freely and abundantly. Most of these fishes reach maturity (and spawn) at their third or fourth year, and therefore they appeared in the river after this period of time in great quantities. Now, because of shortage of fishing tackle, they have doubtless again propagated in quantities (1923),

[1] Proceedings of the National Academy of Sciences, Vol. 9, No. 5, pp. 170–171.

[2] The flowers have been numbered from the apex to the base of the branch of the panicle, thus making the first flower the youngest.

so that rich catches are assured for several years more.

There is a Russian saying, "There is no evil without some gain in it," the truth of which has just been demonstrated by the effect of the war on fish.

I wish to mention in conclusion that an analogous case is cited in the history of Russian fisheries by Danilevsky, namely, that having investigated the fisheries of the Sea of Azof he was surprised at the large catches of fish during several years following the Crimean War (between Russia, Great Britain and France) in 1854–56.

The Sea of Azof lay within the field of naval war operations and, of course, there was no fishing there during two seasons, or in the mouths of two rivers, the Don and the Kuban, which flow into it. This was sufficient to guarantee good catches of fish during several years following the Crimean War in all this fishery district.

N. Borodin

Hartford, Conn.

SCIENTIFIC BOOKS

The Hemiptera, or Sucking Insects. By W. E. Britton, Ph.D., with the collaboration of Herbert Osborn (Parasitica), E. P. Van Duzee (Fulgoridae), D. M. DeLong (Cicadellidae), W. D. Funkhouser (Membracidae), L. A. Stearns (Cercopidae), W. T. Davis (Cicadidae), Edith M. Patch (Psyllidae and Aphididae), H. F. Wilson (Lachnini), A. C. Baker (Callipterini), A. C. Maxson (Pemphiginae), J. F. Abbott (Corixidae), H. H. Knight (Miridae), H. G. Barber (Lygaeidae), J. R. de la Torre-Bueno (Aquatic Heteroptera), H. M. Parshley (Terrestrial Heteroptera). 783 pages and XX plates. State Geological Natural History Survey, Hartford, 1923.

The present volume is one of a series of guides to the insects of Connecticut prepared under the direction of Dr. W. E. Britton, state entomologist. It deals with an order of insects, the Hemiptera, which has been rather generally neglected in America. This is really the first serious attempt to treat in a systematic way the whole order from any given region.

Yet no order of insects is more directly connected with the welfare of the human race than the Hemiptera. The Parasitica all live upon mammals, sucking their blood, and include some of the most important pests of man and the domestic animals. The Homoptera all suck the juices from the leaves or twigs of plants, many species being markedly injurious. Thus the members of the family Cicadellidae feed upon the leaves and are known as "leaf-hoppers," those of the Membracidae feed upon the stems and twigs and are called "tree-hoppers," the Fulgoridae or "lantern flies" are usually on the stems or leaves of herbaceous plants or shrubs. The Cercopidae, known as "frog-hoppers" or "spittle insects," make frothy masses on the stems of grasses or the twigs of trees and shrubs. The members of the Cicadidae, or "harvest flies," are larger than those of the families just mentioned and apparently with all the species the immature forms are subterranean and feed upon the roots of trees: the adults suck sap from twigs and branches, and lay their eggs in them. The best known and most destructive species in this family is the "periodical cicada" or "seventeen-year locust." The Psyllids, or "jumping plant lice," occur on the stems and leaves of woody plants, and only a few species are considered as pests. The aphids, or "plant lice," are very abundant as regards species and individuals and are common to nearly every plant species. They are usually found on the under surface of the leaves or on the tender shoots, often doing great damage. The Aleyrodids, or "white flies," are few in number of species, and occur on the under side of leaves. Only two or three species in our range are considered of economic importance. The Coccidae, or "scale insects," occur on the bark and leaves of trees, the stems and leaves of herbaceous plants and shrubs, and certain species are found in the nests of ants: they are fairly abundant and include a number of important pests.

The Hemiptera, or Heteroptera, include a number of families like the Tingidae or "lace bugs," Minidae or "leaf bugs," Lygaeidae, Coreidae and Neididae, the members of which feed upon plant tissues, and certain species are well-known and important pests. Other families, like the Reduviidae, or "assassin bugs," Phymatidae, or "ambush bugs," Nabidae or "damsel bugs," Veliidae or "water striders," Belostomatidae or "giant water bugs," Corixidae, "water boatmen," Notonectidae, "back swimmers," and it is believed the Aradidae or "flat bugs" are predatory on insects and other small animals. The Cimicidae, or "bed bugs," attack warm blood animals. Other families, like the Pentatomidae, "stink bugs," contain certain species which are plant feeders, while others are predatory upon insects.

Though the insects of most of the families are terrestrial, the species of Veliidae, Nepidae, Saldidae, Nerthridae, Belostomatidae, Corixidae and Notonectidae are aquatic.

In general, the plant-feeding species, as well as those attacking the higher animals, are regarded as injurious, while the predatory species are called beneficial because they attack and destroy many individuals of noxious species. But they are perhaps just as apt to devour harmless or even beneficial species, should such be at hand. From certain species of Coccidae in the Orient is obtained the lac of commerce, and certain other species of the same family formerly supplied the brilliant red dye, cochineal. Thus the Hemiptera as a whole contains many species which are considered injurious, and some beneficial ones: few or none are parasitic on other insects, though many are predatory.

Some 20,000 species of Hemiptera have been described over the whole world; there are about 5,000 species in

North America and over 870 species are known to occur in Connecticut. In number of species, the order is exceeded, at least in Connecticut, only by the Coleoptera (beetles) Lepidoptera (butterflies and moths), Hymenoptera (ants, bees and wasps), and possibly by the Diptera (flies).

Obviously, a work contributed by so many workers can not be entirely uniform in treatment. But as a rule the various families are provided with keys to the genera and to the species. The keys are usually followed by brief descriptions of the species with host plants together with records of distribution. While most of the descriptions are clear and concise, they are somewhat brief for present-day purposes. Nevertheless, one must concede something to the limits of time and space, and the high cost of printing paper; and acknowledge that it would be somewhat difficult to crowd more into the 700 odd pages.

Such a publication, of course, has a much wider application than to the state of Connecticut alone. In general, it may be said that this work applies to most of the northern states east of the Mississippi River. The treatment of the family Cercopidae by Stearns covers the entire United States. The treatment of the family Meridae by Knight is a practical revision of the forms from eastern North America. The treatment of the Cicadellidae by DeLong, the Membracidae by Funkhouser, the Psyllidae and Aphididae by Miss Patch, the Aleyrodidae and Coccidae by Britton, the Lygaeidae by Barber and the Pentatomidae by Parshley, seem to be especially full and complete.

Beginning students and others will welcome numerous illustrations, especially the figures illustrating anatomical details of the various families where the nomenclature has not been standardized. The plates of typical Hemiptera, chiefly by B. L. Walden, are beautiful examples of what may be done in illustrating small insects by photography.

An extended use of the keys in several families has revealed no errors save very minor ones, and the whole work shows many unmistakable evidences of careful attention to details. Zoologists who seem to be inclined to ignore taxonomy or to condemn all working systematists might do well to consider carefully such a volume as the Hemiptera of Connecticut, for here we have the joint work of sixteen authors put in such form as to be readily available to any serious student. Here one will find marshalled a vast array of suborders, families, subfamilies, tribes, genera and species in a manner to commend respect.

Students of Hemiptera will owe a debt to Dr. Britton and his collaborators for many years to come for the excellent manner in which they have carried a difficult task to a successful conclusion.

Z. P. METCALF

NORTH CAROLINA STATE COLLEGE

SPECIAL ARTICLES

THE ORIENTED WEDGE THEORY OF EMULSIONS AND THE INVERSION OF EMULSIONS[1]

FOR the formation of an emulsion the presence of an emulsifying agent is essential, except in the case in which the emulsion is very dilute. Of the typical soluble emulsifying agents sodium oleate may be cited as an example. At the interface between water and benzol the surface tension is about 35 dynes per cm. If sodium oleate is added to the aqueous phase to give a concentration of 0.01 normal or more, the interfacial tension is reduced to about two dynes per cm. According to the theory that the molecules in surfaces are oriented in such a way as to give the maximum lowering of surface energy, it is to be expected that the sodium ions, and the COO^- groups to which they are attracted, are turned toward the water, while the hydrocarbon chains are oriented toward the oil (benzol).

If the two phases are now intimately mixed, as by an egg beater at high speed, a concentrated emulsion of benzol in water is formed. While the drops of benzol have different sizes, about 20 per cent. are found to be close to 1.94 microns in diameter. Each of these drops is, according to the theory, surrounded by a film of oriented molecules of sodium oleate, and this film serves to stabilize the drops. The orientation theory was applied to emulsions in a paper from this laboratory (Harkins, Davies and Clark, *J. Am. Chem. Soc.*, 39, 592–4 and 587 (1917)), and evidence in its favor has recently been obtained by Griffin, who finds the amount of sodium oleate adsorbed at the surface of the drops to correspond to a monomolecular film, within the limits of the experimental error.

It is to be expected that the sodium oleate in the film will ionize to a certain extent, thus leaving a film which consists of some negatively charged oleate ions in addition to the salt. This leads to the idea that the oil drops should be negatively charged, and cataphoresis experiments indicate that their potential is about -0.060 volts with respect to the aqueous phase when any paraffin oil is emulsified by sodium, potassium or caesium oleate. The charge upon the droplets of oil is undoubtedly of great importance in giving stability to the emulsion.

It is known that sodium oleate is somewhat hydrolyzed in aqueous solution, so some free oleic acid and also some acid oleate (McBain) are present. They may be expected to influence the interfacial tension and also the size of the drops in the emulsion. One

[1] A paper which gave some of the data of this paper in preliminary form was presented at the Milwaukee meeting of the American Chemical Society, September, 1923.

effect upon surface tension may be illustrated by an experiment carried out in this laboratory by George L. Clark. In order to avoid the complications due to the partly colloid nature of an aqueous solution of sodium oleate a shorter hydrocarbon chain was used, and the surface tension of 0.1 molar sodium nonylate was determined to be 20 dynes per cm, a remarkably low value for an interfacial tension between an aqueous solution and air. Upon the addition of sodium hydroxide to repress the hydrolysis the surface ten-

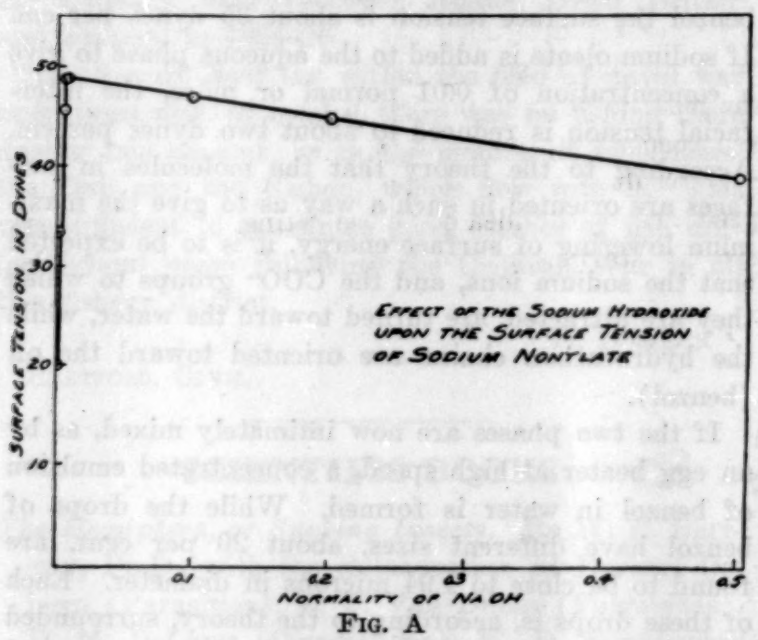

FIG. A

sion rose with extreme rapidity, as is shown in Fig. A. When the sodium hydroxide concentration had reached 0.008 normal the surface tension had risen nearly to 50 dynes per cm, a most remarkable increase. Strangely enough, and presumably by repression of ionization, further addition of sodium hydroxide caused a decrease of surface tension which is linear with the concentration of the base which was added.

The interfacial tension of dilute aqueous sodium oleate solutions against benzol is greatly *decreased* by the addition of sodium hydroxide and also to a considerable extent by the addition of sodium chloride.

The effect of the addition of such a base upon an emulsion is to decrease the size of the drops of oil, and to lower the P. D. at the oil-water interface to about 0.045 volts.

That the phenomenon of the spreading of oleic acid on water is of importance in connection with a study of the theory of emulsions has been recognized for many years in the work of this laboratory. For example, the lecture notes of George L. Clark for March, 1914, illustrate the change of surface tension which occurs when a film of oleic acid is compressed, and give expression to the fundamental idea of the modern theory of orientation in the short statement: "*COOH of acid down, because both acid and water associated and polar.*" The idea that there is some sort of orientation in surfaces was first expressed by Hardy, who, however, made no applications of the idea and did not give the way in which any specific molecule would be oriented, so the above statement is the first record which gives the actual direction of orientation of any specific type of molecule. Hardy (*Proc. Roy. Soc.*, A 86, 634 (1911–12) says:

> If the stray field of a molecule, that is, of a complex of these atomic systems, be unsymmetrical, the surface layer of fluids and solids, which are closely packed states of matter, must differ from the interior mass in the orientation of the axes of the fields with respect surface of a pure substance having all the molecules oriented in the same way instead of purely in random ways.

The effect of a base upon a film of oleic acid is described by Langmuir (*Chem. and Met. Eng.*, 15, 468 (1916)) as follows:

> If a film of closely packed oleic molecules covers the surface to which sodium hydroxide has been added, OH groups are adsorbed by the COOH radicals, causing an expansion of the lower side of the film without a corresponding expansion of the upper side. This results in the bulging of the film downwards in spots so that it finally detaches itself in the form of particles, the outer surfaces of which consist of COOH groups together with adsorbed OH, while the interior consists of the long hydrocarbon chains.
>
> The size of the colloidal particles is determined by the difference in size betwen the two ends of the molecules, just as the size of the arch is dependent upon the relative sizes of the two ends of the stones of which the arch is constructed.

According to Harkins, Davies and Clark (*loc. cit.*), it is *the shape of the molecule of sodium oleate,* and not that of oleic acid with hydroxyl adsorbed on the COOH group, which determines the curvature of the film around the drop in an emulsion produced by oleic acid with sodium hydroxide added. They explain the inversion of an emulsion to a water in oil type which occurs when the salt of a bivalent metal, such as magnesium, calcium or aluminium, is added

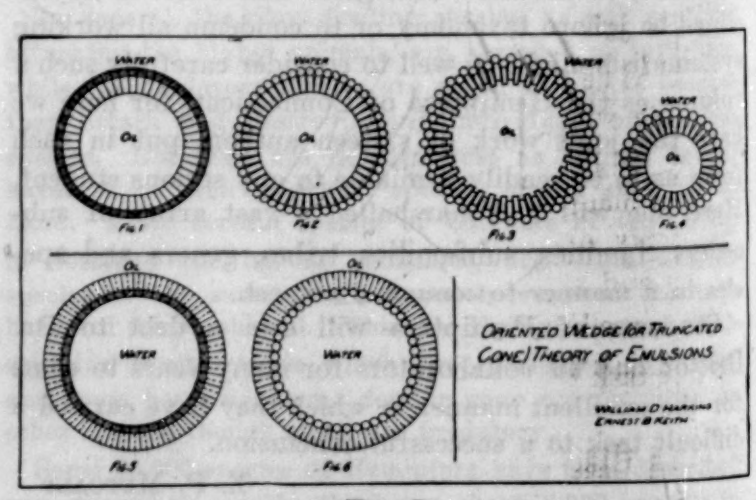

FIG. B

to an oil in water emulsion, as due to the great increase in the cross-section of the oil-like end which results when the soap of a bi- or tri-valent metal is formed. Thus, the cross-section of the two hydrocarbon chains of a magnesium oleate molecule is twice that of the single chain of sodium oleate (or even more on account of motion of the chains). This is illustrated in a highly conventionalized way in Fig. B. Here Figs. 1 and 2 illustrate the oil in water emulsion, which is changed to the water in oil type (Figs. 5 and 6) by the increase in the number of hydrocarbon chains from 1 to 2. Fig. 4 shows how an increase in the size of the polar end of the molecule causes the decrease in the size of the oil drop from that shown in Fig. 2. The size of the drop may be

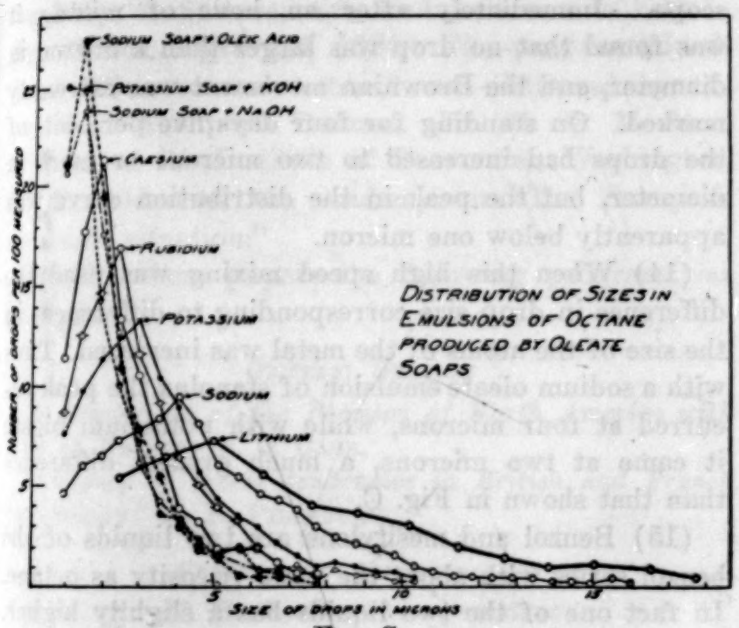

FIG. C

increased by a staggering of the molecules, as in Fig. 3. A more important cause of the increase in size of the oil drops is the penetration of the oil molecules into the spaces between the ends of the hydrocarbon chains.

Definite support for the theory of Harkins, Davies and Clark, that *the shape of the molecule of soap is of importance in determining the size of the drop*, is contained in the recent work of Finkle, Draper and Hildebrand. They find that the size of the oil drops decreases as the theory demands, as the size of the water-like end of the soap molecule is increased by changing from a sodium to a potassium, and still further to a caesium soap. However, their work indicates the diameter of the drops to be about 5×10^{-4} cm, or 50,000 A. U., as the most frequent size in an emulsion produced by sodium oleate. Now a sodium oleate molecule is probably not longer than 30×10^{-8} cm (30 A. U.), or less than one eight hundredth the radius of the drop. Thus, with such fitting as is shown in B, Figs. 1 or 2, the cross-section of the polar end of the sodium oleate molecule could have a diameter not more than 1/800 greater than the homopolar or oil-like end. Now Adam, from his measurements upon films of organic acids, comes to the conclusion that the cross-section of the hydrocarbon chain is 21.0 A.^{2} U., while that of the carboxyl group is 25.1 A.^{2} U., and even this latter value would be considerably increased by the addition of sodium. It is therefore evident that the molecule as a truncated cone has a shape such that a close fitting such as that illustrated in Fig. B, 1 to 4, should give a drop about 100 times smaller in diameter than that actually found. Thus the shape of the molecule of soap does not *uniquely* determine the size of the drops, but in spite of this it seems that it is nevertheless one of the most important factors in the determination. As has been stated, there are a number of factors which may result in giving drops much larger than the size predicted by the idea of "close fitting." Among these are the staggering and bending of molecules in the film; the presence of oil between the hydrocarbon chains; the presence of acid or acid salt, and of oleate ions in the film.

If the film at the surface of the drops contains any considerable proportion of oleic acid and oleate ions, then the addition of sodium hydroxide should repress the hydrolysis and the ionization of the sodium soap and give a larger amount of sodium oleate in the film. Whether this is or is not the true explanation, Fig. C shows that the size of the drops is greatly decreased by the addition of sodium hydroxide, and that the same effect occurs when potassium hydroxide is added to the potassium soap. We find:

(1) The size of the drops is highly dependent upon the nature of the oil which is emulsified. Thus the diameter in microns of the drops at the peak of the distribution curves as produced by tenth molar sodium oleate are: 2.03 in benzol and in mesitylene, 4.12 in octane, and 9.2 in stanolax, an oil which contains the higher liquid paraffins.

(2) When any specific oil is used the diameter of the drops decreases as the atom of the metal becomes larger. Thus the sizes for the drops of octane as emulsified by oleate soaps are: lithium 4.60, sodium 4.12, potassium 3.09, rubidium 2.57 and caesium 2.03. In stanolax: sodium 9.2, potassium 6.9, caesium 4.6.

(3) The addition of the corresponding base to a concentration of tenth molar decreases the diameter to 1.54 for the sodium, and to 1.27 for the potassium soap. Thus in the presence of the base the drops grow smaller as the size of the atom of the metal increases.

(4) The addition of oleic acid to the oil to give a concentration of 0.1 molar also increases the dispersion greatly. For the sodium soap this decreases the diameter at the peak from 4.2 for the neutral soap to 1.54. With stanolax the corresponding decrease is from 9.2 to 4.6.

(5) The addition of either sodium chloride or potassium iodide (0.1 M) to the 0.1 molar solution of the sodium soap decreases the surface tension at the interface, and also decreases the size of the drops.

(6) Figure 3 gives the points which correspond to the measurements. It may be seen that the shape of the distribution curve is similar to that of the Maxwell distribution curve of velocities. The sharpness of the peak is due to the method of measurement, since all the drops within a quarter of a micron of a certain diameter are estimated as of that diameter.

(7) The peaks lie almost upon an equilateral hyperbola, which indicates that all the distribution curves are of the same form. Thus, as the drops grow smaller the peaks rise higher. The caesium oleate distribution curve in octane (Fig. C) is almost exactly the same as the curves for sodium oleate in both benzol and mesitylene. The peaks for stanolax lie on the same hyperbola as those in octane in Fig. C. Thus the sodium oleate peak lies at 9.2 microns at a height of 3.7 per cent.

(8) The work of Harkins and W. A. Thomas gives the interfacial tension between water and purified stanolax as 31 dynes per cm. The addition of 0.001 molar oleic acid to the oil and 0.001 molar sodium hydroxide to the water lowers this value to 7.2. The remarkable effect of the addition of sodium chloride (0.15 M) to the solution of the base is to lower the interfacial tension to almost zero, the nearest approximation to the value being about 0.01 to 0.02 dynes per cm. If both this sodium chloride and 0.0015 molar calcium chloride are present in the 0.001 normal sodium hydroxide solution, the interfacial tension is 7.4. Clowes found that calcium and sodium chlorides have such effects, but did not obtain surface tension values.

(9) An interesting result was obtained with a sodium oleate emulsion of heptane. Upon the addition of oleic acid (0.1 M) to the heptane the emulsion was inverted to the water in oil type.

(10) The size of the drops in an emulsion depends upon the method of preparation, so the above results were obtained only because a carefully standardized method was used. Certain factors, among them the shape of the molecular truncated cone, influence greatly the effect of the method of shaking, of stirring and of homogenizing upon the size of the drop.

(11) Preliminary measurements upon the effect of dilution indicate that the drops are slightly larger in a 0.01 than in a 0.1 molar solution of the same soap.

(12) The standard method used in preparing the above emulsions was to stir equal parts of the soap solution and of oil for ten minutes by an electrically driven egg beater, and then to put the emulsion through a Briggs's homogenizer five times. When this method was followed carefully it was found that practically any distribution curve in Figure C could be duplicated almost exactly except for any minor irregularity.

(13) When, however, a high speed drink mixer was used for about one hour it was found that all of the drops became much smaller. Thus the stanolax as emulsified by sodium oleate by the use of the egg beater gave a peak at 9.2 microns, while the use of the drink mixer reduced the peak to 4.12 microns. Strangely enough the curve obtained in this way was an almost exact duplicate of the sodium oleate curve for octane (Fig. C). With octane and sodium oleate the use of the drink mixer gave such a fine emulsion that the drop sizes could not be measured by a microscope. Immediately after an hour of mixing it was found that no drop was larger than a micron in diameter, and the Brownian movement was extremely marked. On standing for four days five per cent. of the drops had increased to two microns or more in diameter, but the peak in the distribution curve was apparently below one micron.

(14) When this high speed mixing was used the difference in drop size corresponding to differences in the size of the atoms of the metal was increased. Thus with a sodium oleate emulsion of stanolax the peak occurred at four microns, while with potassium oleate it came at two microns, a much greater difference than that shown in Fig. C.

(15) Benzol and mesitylene are two liquids of the benzol series with about the same viscosity as octane. In fact one of the two liquids has a slightly higher, and the other a slightly lower viscosity than octane, yet when emulsified by 0.1 M. sodium oleate, and by the use of the egg beater, both benzol and mesitylene gave the same distribution curve, and this proved to be exactly the same curve as that given by a caesium oleate emulsion of octane. Thus, without a change in the viscosity of the oil, the peak shifted from 4 to 2 microns, that is to one half the diameter.

(16) As corresponds with the theory of the oriented molecular wedge in the interfacial film, 0.1 normal ferric oleate produced an *emulsion of water in oil* in which the drops were much smaller (peak at 1.5 microns) than those produced by magnesium oleate of the same concentration (peak at 2.5 microns). The oil used was stanolax, and the distribution curves were practically the same as those for the sodium soap plus sodium hydroxide, and for rubidium oleate, respectively, as given in Fig C. The three oleate chains of a ferric oleate molecule give a greater cross section to the oil-like end than the two chains of magnesium oleate. Of additional interest is the fact that the inversion of these emulsions to the water in oil type has not materially affected the shape of the distribution curves.

The experiments, outlined only in part in this note, lead to a theory of emulsion which is more comprehensive than has been developed heretofore, and this will be presented in connection with a series of papers which will include measurements on cataphoresis, on surface energy and on other factors of importance in this connection.

WILLIAM D. HARKINS,
ERNEST B. KEITH

UNIVERSITY OF CHICAGO

THE MICHIGAN ACADEMY OF SCIENCE, ARTS AND LETTERS

THE twenty-ninth annual meeting of the Michigan Academy of Science, Arts and Letters was held in Ann Arbor, April 2-4, 1924. The presidential address, "Science and letters," was delivered by the president, Campbell Bonner. Dr. H. G. Moulton, director of the Institute of Economics, Washington, D. C., addressed the academy on "The European economic situation."

Besides these papers the following program was presented:

GENERAL SESSION

A comparison of the Permian of North America with that of Europe: E. C. CASE.

Glimpses of recent tendencies in British and French psychology: W. B. PILLSBURY.

SECTION OF ANTHROPOLOGY

H. H. Bartlett, *vice-president*

Modes of cousin marriage in India: T. C. HODSON.

Greek and Roman stories of children nursed by animals: EUGENE S. MCCARTNEY.

A trephined Indian skull from Devil River, Michigan: W. B. HINSDALE.

Prehistoric "forts" of Michigan, with special reference to the Missaukee Preserve: W. B. HINSDALE.

Paleolithic (?) implements from Washtenaw County, Michigan: J. B. STEERE.

Early musical scales: CHAS. K. WEAD.

The East Indian and Philippine alphabets: H. H. BARTLETT.

Reincarnation and its relation to the cycle of life customs and to social structure: T. C. HODSON.

SECTION OF BOTANY

R. P. Hibbard, *vice-president*

An annotated list of the higher plants of the region of Douglas Lake, Michigan: F. C. GATES and J. H. EHLERS.

An ecological study of Mud Lake, Cheboygan County: ELSIE E. ERICKSON, LOUIS E. GOE and EDITH WOOLLETT. Presented by J. H. EHLERS.

Meteorological data, Douglas Lake, Michigan: F. C. GATES. Presented by J. H. EHLERS.

Vegetation of the Douglas Lake region: F. C. GATES. Presented by J. H. EHLERS.

The ecological structure of the hardwood forests of North America: H. A. GLEASON (by invitation).

The flora of the peninsula of Virginia: EILEEN W. ERLANSON.

The flowering plants and ferns of Warren Woods, Berrien County, Michigan: C. BILLINGTON.

Leaf fall in the monsoon forest (illustrated): L. A. KENOYER.

Supplement to the "Guide to the literature for the identification of Fungi": E. A. BESSEY.

The relationships of the Ascomyceteae, Basidiomyceteae, and Telisporeae (illustrated): E. A. BESSEY.

Notes on selective action of preservatives on mold spores: ADELIA MCCREA.

The Genus Lepiota in the United States: C. H. KAUFFMAN.

Formes fraxineus in culture: DOW V. BAXTER.

The Pythiomorphaceae and a species of the group from Michigan: BESSIE B. KANOUSE.

The perfect stage of the Valsaceae in culture and the hypothesis of sexual strains in this group: L. E. WEHMEYER.

The morphological development of Asterosporium hoffmani Kze: W. A. ARCHER.

Morphology of the seed in Phytolacca (illustrated): E. F. WOODCOCK.

The mung bean (lantern): H. H. M. BOWMAN.

Herbaria—useful and otherwise: E. E. WATSON (by invitation).

Growth and yield of corn as influenced by the date of planting: D. A. SEELEY (by invitation).

A comparative study of Lauraceous woods: W. W. TUPPER.

The inheritance of red bud color in crosses of Oenothera pratincola and related forms: FRIEDA COBB BLANCHARD and H. H. BARTLETT.

The absence of chromosome pairing during meiosis in Oenothera biennis: STERLING H. EMERSON (by invitation).

Do balanced lethals explain the Oenothera problem? STERLING H. EMERSON (by invitation).

Genetic factors for yellow endosperm color in maize: E. G. ANDERSON.

X-rays and the frequency of non-disjunction in Drosophila: E. G. ANDERSON (by invitation).

Experiments with the annual variety of sweet clover (Melilotus alba): HUGH B. SMITH (by invitation).

An injurious factor affecting the viability of Phaseolus vulgarus, soaked prior to germination: PAUL TILFORD, C. F. ABEL and R. P. HIBBARD.

Variability in wheat seedlings in water (solution) cultures: R. P. HIBBARD.

(Joint session with Section of Zoology)

Michigan state parks: P. J. HOFFMASTER.

Douglass Houghton and the Schoolcraft expeditions of 1831 and 1832: LOIS SMITH EHLERS.

The asmotic properties of living cells: L. J. HEILBRUNN.

The biological sciences in Albion College: A. M. CHICKERING.

The Idaho white pine forest (illustrated): W. E. PRAEGER.

The ecologic communities of Charlevoix County and vicinity (illustrated): L. R. DICE.

SECTION OF ECONOMICS

C. E. GRIFFIN, *vice-president*

What is income? W. A. PATTON.

Going value: B. W. LEWIS.

Fair return: N. L. SMITH.

Financing in the automobile industry: L. H. SELTZER (by invitation).

The interrelation of fatigue, incentives and efficiency: Z. C. DICKINSON.

Cooperation in our future agriculture: J. T. HORNER (by invitation).

Progress report on the Michigan Land Economic Survey: P. S. LOVEJOY and WADE DE VRIES.

A type study in regional geography: K. C. MCMURRY (by invitation).

Henry Carter Adams on the labor problem: L. VOLIN (by invitation).

Recent criticisms of the theory of international values: C. H. MAY (by invitation).

Recent data on public health: A. E. WOOD (by invitation).

SECTION OF GEOLOGY AND MINERALOGY

Helen Martin, *vice-president*

An interesting Ordovician reef on Sulphur Island, Lake Huron (illustrated): G. M. EHLERS.

Contributions to the stratigraphy of certain Ordovician deposits of Michigan and adjacent parts of Ontario: E. O. ULRICH, A. E. FOERSTE, W. H. SHIDELER, G. M. EHLERS and R. C. HUSSEY. Presented by Mr. EHLERS and Mr. HUSSEY.

Marcasite from the Racine Dolomite, Racine, Wisconsin: C. W. COOK.

Distribution and character of the Bell Shale in Presque Isle and Alpena Counties, Michigan: R. A. SMITH.

The Upper Traverse Formation in Antrim and Cheboygan Counties, Michigan: R. A. SMITH.

Notes on the Antrim Formation: R. A. SMITH.

The peculiar color of Alexandrite: E. F. HOLDEN.

New methods of revealing buried geological structures (illustrated): W. H. HOBBS.

The stratigraphy of the Mexican oil fields (illustrated): W. A. VER WIEBE (by invitation).

Demonstration of Triassic vertebrates from Texas: E. C. CASE.

Some unusual specimens of float copper (illustrated): E. H. KRAUSE (read by E. F. HOLDEN).

Glacial formations north of the driftless area: FRANK LEVERETT.

Some new features in regard to the formation of the campus outwash plain, University of Michigan: R. C. HUSSEY.

Coral reefs in their Tectonic relationships (illustrated): W. H. HOBBS.

The geology of China: H. T. LEE (by invitation).

Note on Andulusite, a new use and some thermal properties (illustrated by specimens): A. B. PECK.

An interesting occurrence of Molybdenite: C. W. COOK.

Assaying with the blowpipe; lead, copper and silver ores: W. F. HUNT.

SECTION OF LANGUAGE AND LITERATURE

John W. Scholl, *vice-president*

Browning's conception of love as represented in "Paracelsus": WILLIAM O. RAYMOND.

Assyrian medicine in the Seventh Century, B. C.: LEROY WATERMAN.

Graphophonic studies—Accent in English: JOHN H. MUYSKENS.

Corneille, a seventeenth century modernist: EUGENE R. ROVILLAIN.

Deism before Lord Herbert: LOUIS I. BREDVOLD.

The Berlin papyrus of Genesis: A paleographical study (illustrated): HENRY A. SANDERS.

The contribution of Nahuatl to Spanish phonetics: NORMAN L. WILLEY.

SECTION OF HISTORY AND POLITICAL SCIENCE

Everett S. Brown, *vice-president*

New light on Coronado: ARTHUR S. AITON.

Development of self-government in the Dutch East Indies: RALSTON HAYDEN.

The Philippines after twenty-five years of American sovereignty: MAXIMO KALAW (by invitation).

The historical background of eastern Europe: PRESTON SLOSSON.

How will the student be trained to know what is history? HARRY L. GIBB.

SECTION OF MATHEMATICS

T. H. Hildebrandt, *vice-president*

(Program presented by the Michigan Section of the Mathematical Association of America.)

The theory of sampling: H. C. CARVER.

Some configurations associated with a net on a surface: V. G. GROVE.

On the Hatchet planimeter: D. KAZARINOFF.

Early American arithmetics: L. C. KARPINSKI.

Some problems in yield in land contracts: L. C. EMMONS.

A theorem on means: N. H. ANNING.

SECTION OF PSYCHOLOGY

H. F. Adams, *vice-president*

An experimental study of the emotions: F. L. DIMMICK.

The place of consciousness in the behaviorist scheme: O. O. NORRIS.

The significance of emotions from the behavioristic standpoint: T. S. HENRY.

Some phases of Freudian psychology: N. A. HARVEY.

Extra-curriculum activities and after success: ADELBERT FORD.

Discussion, *Should mental tests be substituted for examinations?* Affirmative: N. A. HARVEY, E. B. SKAGGS. Negative: C. H. GRIFFITHS, T. S. HENRY.

SECTION OF SANITARY AND MEDICAL SCIENCE

Philip Hadley, *vice-president*

Some properties of the Rabies virus: ALDEN F. ROE.

Observations on transmissible bacterial autolysis: GEORGE COLLINS (by invitation).

Some precursors of lysine: D. A. MCGINTY (by invitation).

The cultivation of Bacillus abortus: D. E. HALSEY (by invitation).

Bacterium Pullorum studies: W. L. MALIMAN (by invitation).

The Detroit Filtration Plant and methods of laboratory control: WM. M. WALLACE (by invitation).

The pH values represented by Medalia's colorimetric standards: MAX S. MARSHALL.

Relation between salivary and blood urea: HELEN UPDEGRAFF (by invitation).

Ultra-violet energy: its therapeutic application: JOHN F. KELLEY (by invitation).

Comparative study of precipitinogen and precipitin curves: GEO. F. FORSTER.

Variations in the intestinal flora of rats: HELEN S. MITCHELL.

Regarding the vermicidal action of iodine: W. L. CHANDLER (by invitation).

The lime content of saliva and its relation to enamel structure: U. G. RICKERT (by invitation).

Bacillus acidophilus: Its relation to dental caries: R. W. BUNTING.

Oxidation of the sulphur in cystine and related sulphur compounds by the animal organism: HOWARD B. LEWIS.

Congenital cystic kidney: JAMES E. DAVIS.

The development of the bovine placenta and its significance in uterine infections: E. T. HALLAM (by invitation).

The localization of Spirochaeta Pallida in human tissues: ALDRED S. WARTHIN (by invitation).

The localization of Leptospira icteoides in tissues of experimental animals: RUTH WANSTROM (by invitation).

The inhibitory control of the stomach of Necturus: T. L. PATTERSON.

Respiration of the tubercle bacillus: F. G. NOVY.

(1) Estimation of Co_2 dissolved in culture media; (2) Respiration of protozoa: MALCOLM H. SOULE.

The bacteriology and serology of scarlet fever: R. W. PRYER.

Comparative study of different antigens in the Kahn Precipitation Test: PEARL KENDRICK, W. W. DUEMLING and R. L. KAHN.

Observations on the Kahn precipitation test: E. T. SCHUEREN.

The clinical application of the Kahn Precipitation Test: HARTHER L. KEIM.

Some factors governing the serology of syphilis: R. L. KAHN.

The relation between health and the price of rubber in the Amazon Valley: CARL D. LA RUE.

SECTION OF ZOOLOGY

L. R. Dice, *vice-president*

Are Protozoa simple animals? (illustrated): C. V. TAYLOR (by invitation).

Some problems in the propagation of trout in Michigan: JAN METZELAAR.

Variation in the maximum depth at which fish can live during summer in a moderately deep lake with a thermocline: (Read by title): FRANK SMITH.

Observations on the early larval activities of Nymphula maculalis (Lepidoptera): PAUL S. WELCH.

A new form of acarinid parasitism in Orthoptera: PAUL S. WELCH and L. P. WEHRLE.

Recent advances in the classification of the North American Unionidae: BRYANT WALKER.

A list of Coleoptera from Charlevoix County, Michigan: MELVILLE H. HATCH.

The distribution of some species of the genus Ameiva: A. G. RUTHVEN.

The life cycle and growth of lampreys: CARL L. HUBBS.

An ichthyological survey of the Boardman River system of Michigan (illustrated): T. L. HANKINSON.

Notes on some Michigan snakes: T. H. LANGLOIS.

Observations on the life-history of the newt in northern Michigan: D. E. S. BROWN.

A collection of amphibians and reptiles from southeastern Missouri and southern Illinois: FRANK N. BLANCHARD.

A key to the snakes of the United States, Canada and Lower California: FRANK N. BLANCHARD.

A name for the black Pituophis from Alabama: FRANK N. BLANCHARD.

The forms of Carphophis: FRANK N. BLANCHARD.

Notes on the birds of Charlevoix County and vicinity, (read by title): J. VAN TYNE.

Irritability in Amoeba proteus, (read by title): H. T. FOLGER.

Illustrations of the life-histories of Michigan birds. 1. The great blue heron, (read by title): W. E. HASTINGS.

The predatory animal control work of the Michigan department of conservation, (read by title): EDGAR COCHRUN.

Further notes on the making of dried preparations, (read by title): GEORGE R. LARUE.

Activated trypsin for cleaning skeletons, (read by title): GEORGE R. LARUE.

This session of the academy was well attended and was one of the most successful in its history.

Resolutions were adopted favoring the establishment of a state or national park on Isle Royale, Lake Superior; supporting the establishment of a national monument covering the Glacier Bay Region, Alaska; advocating the extension of the Superior National Forest in Minnesota; and advocating the preservation of the ancient relics, monuments, earthworks and other prehistoric remains and records of Michigan.

The officers elected for the ensuing year are as follows:

President: H. H. Bartlett, Ann Arbor.
Vice-President: E. S. Brown, Ann Arbor.
Secretary-treasurer: L. R. Dice, Ann Arbor.
Editor: P. S. Welch, Ann Arbor.
Librarian: W. W. Bishop, Ann Arbor.

The following section chairmen were elected:

Anthropology: E. S. McCartney, Ann Arbor.
Botany: J. B. Pollock, Ann Arbor.
Economics: Z. C. Dickinson, Ann Arbor.
Geology and Mineralogy: L. M. Gould, Ann Arbor.
History and Political Science: Arthur S. Aiton, Ann Arbor.
Language and Literature: Oscar J. Campbell, Ann Arbor.
Mathematics: E. R. Sleight, Olivet.
Psychology: Samuel Renshaw, Kalamazoo.
Sanitary and Medical Science: C. C. Young, Lansing.
Zoology: H. M. MacCurdy, Alma.

L. R. DICE,
Secretary-Treasurer.

THE OHIO ACADEMY OF SCIENCE

THE thirty-fourth annual meeting of the Ohio Academy of Science was held at the Ohio State University on April 18 and 19, 1924, under the presidency of Dr. Kirtley F. Mather, of Denison University, Granville, Ohio. About 100 members were in attendance.

Dr. Herbert Osborn, chairman of the committee on necrology, read an appreciative memoir of Dr. T. C. Mendenhall, of Ravenna, Ohio, whose death occurred at his home on March 22, 1924. A member since 1912 and president in 1914, Dr. Mendenhall was always deeply and actively interested in the work of the academy and rarely ever missed an annual meeting. He was trustee of the McMillin Research Fund from 1916 to the time of his death. It is probably safe to say that no other member of the academy held the love and esteem and the commanding influence in the academy that Dr. Mendenhall did. His passing is an irreparable loss. The memoir will be published in full in the near future in the *Ohio Journal of Science.*

Fifty-nine new members were elected, and the following fourteen members were elected to fellowship: Ralph V. Bangham, John W. Baringer, Samuel Wood Chase, Guy W. Conrey, Floyd Carlton Dockeray, H. A. Gossard, Roy Graham Hoskins, Lawrence L. Huber, Thomas G. Phillips, Edmund Secrest, Ernest Rice Smith, Paris B. Stockdale, Herbert Anderson Toops and Charles J. Willard.

Officers for 1924–25 were elected as follows: *President,* E. N. Transeau, Ohio State University; *secretary,* William H. Alexander, U. S. Weather Bureau, Columbus; *treasurer,* A. E. Waller, Ohio State University; *vice-presidents—zoology,* R. V. Bangham, Wooster College; *botany,* Edmund Secrest, Ohio Agricultural Experiment Station; *geology,* G. W. Conrey, Ohio State University; *medical sciences,* R. G. Hoskins, Ohio State University; *physical sciences,* C. D. Coons, Denison University; *psychology,* F. C. Dockeray.

Quite a number of the members of the academy participated, by invitation, in a field meeting put on by the Ohio Forestry Association on September 21 and 22, 1923.

The scientific program was as follows:

PRESIDENTIAL ADDRESS

Geologic factors in organic evolution: KIRTLEY F. MATHER.

PUBLIC ADDRESS

How shall we measure the quantity of life? ALBERT P. MATHEWS.

PAPERS

Laboratory exercises in atomic structure: WM. LLOYD EVANS and JESSE E. DAY.

The valley of ten thousand smokes in 1923: KIRTLEY F. MATHER.

Recent work in endocrinology: R. G. HOSKINS.

The weather: W. C. DEVEREAUX.

Pressure and life: STANLEY G. ZINKE.

Glare (with demonstrations): F. C. CALDWELL.

Medical education in colonial America: F. C. WAITE.

The relation of fish production to forestation: RAYMOND C. OSBURN.

The application of radio in distance determination: GEORGE LEWIS.

A hydrogen sulfide delivery system: JESSE E. DAY.

Respiration in the orthoptera: M. O. LEE.

The nutrition of euglena gracilis: W. J. KOSTIR.

Pest hunts in Wood County: E. L. MOSELEY.

The development of the intestinal coiling of the minnow (campostoma anomalum): W. C. KRAATZ.

Morphology of gigantorhynchus (ancanthocephala): M. W. CASKEY.

The periodical cicada in Ohio: H. A. GOSSARD.

An Ohio record for the dragonfly (tachopteryx thoreyi): JAMES S. HINE.

Parasites of the black bass: R. V. BANGHAM.

Habits of the common water snake, particularly in its relation to fish: F. A. HANAWALT.

New terms suggested to designate the various modes of nutrition on organisms: W. J. KOSTIR.

Recent mammal records in Ohio: JAMES S. HINE.

Ecologic notes on some homoptera of the Southwest: HERBERT OSBORN.

The early differentiation of the longitudinal zones in the neural plate of rana: R. A. KNOUFF.

Two new hereditary tumors in drosophila: IRA T. WILSON.

The primitive lines in amblystoma: F. L. LANDACRE.

Comparisons of protozoan nuclei: MAYNARD M. METCALF.

A study of comparable developmental stages in chick and pig embryos: B. M. PATTEN.

The differentiation of the epichordal and prechordal portions of the brain in amblystoma: R. C. BAKER.

The spherical blackboard in the teaching of embryology: EDWARD L. RICE.

The effect of basal metabolism of ingested adrenalin chloride: FRED. A. HITCHCOCK.

Heredity defects of the human hand, with special reference to symphalangism: R. A. HEFNER.

A novel type of symphalangism (?) or hypodactyly (?): O. L. INMAN.

Some practical and theoretical aspects of lubricating oil emulsions as a scalecide: L. L. HUBER.

Interaction of the genes in the production of eye color in drosophila: W. P. SPENCER.

The development of forestry practice: EDMUND SECREST.

Botany: Opportunity: MAXIMILIAN BRAAM.

Present tendencies in high-school biological courses: WM. E. NIEHAUS.

The development of bisporangiate flowers in sagittaria latifolia: JOHN H. SCHAFFNER.

A case of teratological inflorescence in alsike clover: FREDA DETMERS.

Some new heritable characters of corn found in the culture at Ohio State University: MARION T. MYERS.

Studies of variation in the fleshy fungi: H. C. BEARDSLEE.

The trend of investigation in plant growth: H. C. SAMPSON.

The change of opposite to alternate phyllotaxy in hemp by means of photoperiodism: JOHN H. SCHAFFNER.

The physiology of stomata: J. D. SAYRE.

The diffusion of water vapor through small openings: J. D. SAYRE.

Water transfer in plant cells: H. M. BENEDICT.

Some filamentous algae from Iowa: L. H. TIFFANY.

The zygnemales: E. N. TRANSEAU.

The peculiar flora of the sand region west of Toledo: E. L. MOSELEY.

The distribution of the pine in Ohio: FOREST DEAN.

The economic features of the yellow poplar in Ohio: O. A. ALDERMAN.

Progress report on plantings on the slope of the dams in the Miami Conservancy District: A. E. WALLER.

Observations of a plant collector on the island of Hainan: F. A. MCCLURE.

The uredinales of Ohio—preliminary: W. G. STOVER.

The relation of weather conditions to the development of apple scab at Columbus in 1923: HOWARD W. JOHNSON.

The infection period of apple blotch in central Ohio in 1923: CURTIS MAY.

The relation of fusarium moniliforme to the ear, stalk and root-rot of corn: D. P. LIMBER.

Studies of toxin production in the fusarium wilt of tomato: IVAN E. MASSAR.

A bud sport in pelargonium accompanied by the loss of two chromosomes: PAUL B. SEARS.

Some Ohio inter-morainal lakes and lake beds: GEO. D. HUBBARD.

The age of the glacial drift in Licking County, Ohio: RALPH G. LUSK.

Some glacial pebbles and cobbles found beyond the glacial boundary in Muskingum and Guernsey counties: C. F. MOSES.

The composition of the Illinoian drift in Clermont County, Ohio: G. W. CONREY.

Drainage changes in the Warren-Youngstown-Sharon-New Castle areas: G. F. LAMB.

Erosion levels in the Colorado Plateau: ROBERT F. WEBB.

Differences in the form of species usually regarded as common to North America and Europe: AUG. F. FOERSTE.

Plant life in ordovician and silurian times: AUG. F. FOERSTE.

The positions occupied by orthoceroids while alive: AUG. F. FOERSTE.

An amphibian trail from the Pottsville formation: G. F. LAMB.

The Cleveland shale fishes of northern Ohio: J. E. HYDE.

Two recent papers on the earth's interior: WALTER H. BUCHER.

The importance of water conditions on the shallow oil sands of Ohio: KENNETH COTTINGHAM.

The structure of the Clinton sandstone in Ohio and its relation to oil and gas accumulation: ROBERT LOCKETT.

Clinton sand structure of northern Ohio in its relation to production: A. W. MELHORN.

A structural feature of Wood County, Ohio: J. ERNEST CARMAN.

The decline of mining activity in Colorado: FRANK R. VAN HORN.

The glass sands of Ohio: J. A. BOWNOCKER.

Bacterial precipitation in freshwater: ALLYN C. SWINNERTON.

The significance to sedimentation of the Amherst Berea deposits: J. E. HYDE.

Some broader correlations of the Richmond: W. H. SHIDELER.

The rock section at the O'Shaughnessy Dam: J. ERNEST CARMAN.

Effect of cutting upon the rate of hair growth: R. J. SEYMOUR.

Formation and structure of dental enamel: SAMUEL W. CHASE.

Status of the occupational disease question in Ohio, based on official figures; present tendencies: EMERY R. HAYHURST.

Recent studies on food accessories in a legume: H. H. M. BOWMAN.

Effect on nasal metabolism of adrenalin by mouth: F. A. HITCHCOCK.

Factors that influence the knee jerk: W. W. TUTTLE.

Effect of adrenalin on the temperature of the brain: W. P. SPENCER and M. W. CASKEY.

Relations of adrenals to bodily activities of the rat: E. P. DURRANT.

The effect of syphilis on dentition and on tooth structure: L. J. KARNOSH.